ARTICLE 1
DEFINITIONS AND REQUIREMENTS

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General Acute Care Hospital as used in Chapter 6, Part 1 means a hospital building as defined in Section 129725 of the Health and Safety Code and that is also licensed pursuant to subdivision (a) of Section 1250 of the Health and Safety Code, but does not include these buildings if the beds licensed pursuant to subdivision (a) of Section 1250 of the Health and Safety Code, as of January 1, 1995, comprise 10 percent or less of the total licensed beds of the total physical plant, and does not include facilities owned or operated, or both, by the Department of Corrections. It also precludes hospital buildings that may be licensed under the above mentioned code sections, but provide skilled nursing or acute psychiatric services only.

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ARTICLE 10
EVALUATION OF
ELEMENTS THAT ARE NOT PART OF
THE LATERAL FORCE RESISTING SYSTEM

10.0 INTRODUCTION

This article sets forth general requirements that apply to nonstructural elements, related to life-safety issues. Article 11 addresses evaluation of critical nonstructural systems need for continued hospital function following an earthquake, and assignment of buildings to Nonstructural Performance Categories.

The evaluation statements discussed in this article (and listed in the Appendix) deal with life-safety concerns. Some of the statements can be answered directly. For others, further investigation will be required in accordance with evaluation procedures indicated in other articles of these regulations using seismic forces indicated in Sec. 2.4.6 and the appropriate C_c seismic coefficient given in Table 2.4.3.1. Also, the materials used in the nonstructural element and its connections must be considered.

10.1 NONSTRUCTURAL WALLS

The term "nonstructural walls" refers to walls that are not part of the load carrying system, but may become load bearing upon attachment and interaction with other elements. Evaluation must be made to determine if they are capable of resisting seismic forces required by Sec. 2.4.6 as well as the other requirements of these regulations.

10.1.1 PARTITIONS:

10.1.1.1 MASONRY PARTITIONS: There are no unbraced unreinforced masonry or hollow clay tile partitions in critical care areas, clinical laboratory service spaces, pharmaceutical service spaces, radiological service spaces, and central and sterile supply areas, exit corridors, elevator shafts, or stairwells.

For conforming buildings, the evaluator may consider this condition as mitigated, and no calculations are necessary. Check for the presence of support angles at floor and roof, and for spaces at the sides and top of the wall to provide for interaction of the structural system.

10.1.1.2 STRUCTURAL SEPARATIONS: At structural separations, partitions in exit corridors have seismic or control joints.

Check that seismic and/or control joints have been provided at structural separations. Conforming buildings that fail this check shall be placed in SPC 4.

10.1.1.3 PARTITION BRACING: In exit corridors, the tops of partitions that only extend to the ceiling line have lateral bracing.

For conforming buildings, the evaluator may consider this condition as mitigated, and no calculations are necessary. Partitions extending only to ceilings may overturn or buckle due to the lack of bracing.

10.1.2 CLADDING AND VENEER:

For conforming buildings, the evaluator may consider these conditions as mitigated, and no calculations are necessary. Exterior wall panels or cladding can fall if their connections to the building frames have insufficient strength and/or ductility.

10.1.2.1 MASONRY VENEER: Masonry veneer is connected to the back-up with corrosion-resistant ties spaced 24 inches on center maximum with at least one tie for every 2-2/3 square feet.

For conforming buildings, the evaluator may consider this condition as mitigated, and no calculations are necessary. Check for the presence of the required ties.

10.1.2.2 CLADDING PANELS IN MOMENT FRAME BUILDINGS: For moment frame buildings of steel or concrete, panels are isolated from the structural frame to absorb predicted inter-story drift without collapse.

For conforming buildings, the evaluator may consider this condition as mitigated, and no calculations are necessary. Check the ability of the cladding panels and their connections to tolerate the story drift computed in Section 2.4.4 with out an anchorage failure.

10.1.2.3 CLADDING PANEL CONNECTIONS: Where bearing connections are required, there are at least two bearing connections for each cladding panel, and there are at least four connections for each cladding panel capable of resisting out-of-plane forces.

For conforming buildings, the evaluator may consider this condition as mitigated, and no calculations are necessary. Verify that an adequate number of the appropriate connection types are present for each cladding panel.

10.1.2.4 CLADDING PANEL CONDITION: Cladding panel connections appear to be installed properly. No connection element is severely deteriorated or corroded. There is no cracking in the panel materials indicative of substantial structural distress. There is no substantial damage to exterior cladding due to water leakage. There is no substantial damage to exterior wall cladding due to temperature movements.

Substantial deterioration can lead to loss of cladding elements or panels. Exterior walls shall be checked for deterioration. Damage due to corrosion, rotting, freezing, or erosion can be concealed within wall. Probe into the wall space if necessary, for signs of water leakage at vulnerable interior spaces (e.g., around windows and at floor areas). Check elements that tie cladding to the back-up structure and that tie the back-up structure to floor and roof slabs. Check exterior walls for cracking due to thermal movements. Check the cladding systems with appropriate reductions in member capacities. Conforming buildings that fail this check shall be placed in SPC 4.

10.1.3 METAL STUD BACK-UP SYSTEMS

10.1.3.1 METAL STUD BACK-UP SYSTEMS, GENERAL: Additional steel studs frame window and door openings. Corrosion of veneer ties, tie screws, studs, and stud tracks is minimal. Stud tracks are adequately fastened to the structural frame.

For conforming buildings, the evaluator may consider this condition as mitigated, and no calculations are necessary. Verify that adequate framing has been provided around openings in the exterior walls. Check the cladding systems with appropriate reductions in member capacities. Check the adequacy of the connection to the structural frame using the forces specified in Section 2.4.6.

10.1.3.2 MASONRY VENEER WITH STUD BACK-UP: Masonry veneer more than 30 feet above the ground is supported by shelf angles or other elements at each floor level. Masonry veneer is adequately anchored to the back-up at locations of through-wall flashing. Masonry veneer is connected to the back-up with corrosion-resistant ties spaced 24 inches on center maximum and with at least one tie for every 2-2/3 square feet.

For conforming buildings, the evaluator may consider this condition as mitigated, and no calculations are necessary. Check that adequate supports and ties are provided.

10.1.4 MASONRY VENEER WITH CONCRETE BLOCK BACK-UP

10.1.4.1 MASONRY VENEER WITH CONCRETE BLOCK BACK-UP, GENERAL: The concrete block back-up qualifies as reinforced masonry

For conforming buildings, the evaluator may consider this condition as mitigated, and no calculations are necessary. Verify that the concrete block back-up meets the requirements of Sections 5.3.2 and 5.3.3.

10.1.4.2 MASONRY VENEER SUPPORT: Masonry veneer more than 30 feet above the ground is supported by shelf angles or other elements at each floor level. Masonry veneer is adequately anchored to the back-up at locations of through-wall flashing. Masonry veneer is connected to the back-up with corrosion-resistant ties spaced 24 inches on center maximum and with at least one tie for every 2-2/3 square feet. The concrete block back-up is positively anchored to the structural frame at 4 feet maximum intervals along the floors and roofs.

For conforming buildings, the evaluator may consider this condition as mitigated, and no calculations are necessary. Check that adequate supports and ties are provided.

10.1.5 OTHER VENEER/PANEL SYSTEMS

10.1.5.1 THIN STONE VENEER PANELS: Stone anchorages are adequate for computed loads.

For conforming buildings, the evaluator may consider this condition as mitigated, and no calculations are necessary. There are no visible cracks or weak veins in the stone. Check the adequacy of the connection to the stone anchorage using the forces specified in Section 2.4.6.

10.1.5.2 WOOD/AGGREGATE PANELS: There is no visible deterioration of screws or wood at panel attachment points.

The deficiency is in the strength of the connections. Determine the cause and extent of distress and check the attachment of the panels with appropriate reductions in capacity. Conforming buildings that fail this check shall be placed in SPC ~~2~~4.

10.1.6 PARAPETS, CORNICES, ORNAMENTATION, AND APPENDAGES: There are no laterally unsupported unreinforced masonry parapets or cornices above the highest anchorage level with height/thickness ratios greater than 1.5. Concrete parapets with height/thickness ratios greater than 1.5 have vertical reinforcement. Cornices, parapets, signs, and other appendages that extend above the highest anchorage level or cantilever from exterior wall faces and other exterior wall ornamentation are reinforced and well anchored to the structural system.

For conforming buildings, the evaluator may consider this condition as mitigated, and no calculations are necessary. If any of these items are of insufficient strength and/or are not securely attached to the structural elements, they may break off and fall, becoming significant life-safety hazards. Check the adequacy of these items using the forces specified in Section 2.4.6.

10.1.7 MEANS OF EGRESS: Canopies are anchored and braced to prevent collapse and blockage of building exits.

For conforming buildings, the evaluator may consider this condition as mitigated, and no calculations are necessary. Check canopies for the forces specified in Section 2.4.6.

~~10.2 NONSTRUCTURAL ELEMENTS~~

~~**10.2.1 CEILING SYSTEMS: Ceiling-supported lighting or mechanical fixtures are adequately braced or supported. The ceiling system is not required to laterally support the top of gypsum board, masonry, or hollow clay tile partitions.**~~

~~For conforming buildings, the evaluator may consider this condition as mitigated, and no calculations are necessary. Check that lighting or mechanical fixtures are adequately braced, or provided with safety wires to prevent the fixtures from falling and striking building occupants. Check ceilings that support partition systems for adequate capacity.~~

10.2.2 EMERGENCY LIGHTING EQUIPMENT: Emergency lighting equipment and signs are anchored and/or braced to resist vertical and horizontal earthquake loads.

For conforming buildings, the evaluator may consider this condition as mitigated, and no calculations are necessary. Check that emergency lighting fixtures and equipment are adequately braced and anchored.

10.2.3 CHIMNEYS: No unreinforced masonry chimney extends above the roof surface more than twice the least dimension of the chimney. Masonry chimneys are anchored to the floors and roof.

For conforming buildings, the evaluator may consider this condition as mitigated, and no calculations are necessary. Unsupported unreinforced masonry chimneys can collapse. Verify that an adequate connection between the chimney, floor and roof structures exists.

10.2.4 MEANS OF EGRESS: Stair enclosures do not contain any piping or equipment except as required for life safety. Canopies are anchored and braced to prevent collapse and blockage of building exits.

For conforming buildings, the evaluator may consider this condition as mitigated, and no calculations are necessary. Check for piping or equipment in the stair enclosure that may displace, impeding egress. Check canopies for the forces specified in Section 2.4.6.

10.2.5 MECHANICAL AND ELECTRICAL EQUIPMENT: No pieces of mechanical equipment weighing more than 20 pounds are suspended from the structure without seismic bracing.

For conforming buildings, the evaluator may consider this condition as mitigated, and no calculations are necessary. Verify that suspended equipment weighing more than 20 pounds is adequately braced.

APPENDIX
GENERAL SETS OF EVALUATION STATEMENTS

EVALUATION STATEMENTS FOR ELEMENTS THAT ARE NOT PART OF

Address the following evaluation statements, marking each either true (T) or false (F). Statements that are found to be true identify issues that are acceptable according to the criteria of these regulations; statements that are found to be false identify issues that need investigation. For guidance in the investigation, refer to the section indicated in parentheses after the headings.

THE LATERAL FORCE RESISTING SYSTEM

NON STRUCTURAL WALLS

Partitions

T F N/A MASONRY PARTITIONS: There are no unbraced unreinforced masonry or hollow clay tile partitions in **critical care areas, clinical laboratory service spaces, pharmaceutical service spaces, radiological service spaces, and central and sterile supply areas,** exit corridors, elevator shafts, or stairwells. (Sec. 10.1.1.1)

T F N/A STRUCTURAL SEPARATIONS: At structural separations, partitions in exit corridors have seismic or control joints. (Sec 10.1.1.2)

T F N/A PARTITION BRACING: In exit corridors, the tops of partitions that only extend to the ceiling line have lateral bracing. (Section 10.1.1.3)

Cladding and Veneer

T F N/A MASONRY VENEER: Masonry veneer is connected to the back-upwith corrosion-resistant ties spaced 24 inches on center maximum with at least one tie for every 2-2/3 square feet. (Section 10.1.2.1)

T F N/A CLADDING PANELS IN MOMENT FRAME BUILDINGS: For moment frame buildings of steel or concrete, panels are isolated from the structural frame to absorb predicted inter-story drift without collapse. (Section 10.1.2.2)

T F N/A CLADDING PANEL CONNECTIONS: Where bearing connections are required, there are at least two bearing connections for each cladding panel, and there are at least four connections for each cladding panel capable of resisting out-of-plane forces. (Section 10.1.2.3)

T F N/A CLADDING PANEL CONDITION: Cladding panel connections appear to be installed properly. No connection element is severely deteriorated or corroded. There is no cracking in the panel materials indicative of substantial structural distress. There is no substantial damage to exterior cladding due to water leakage. There is no substantial damage to exterior wall cladding due to temperature movements. (Section 10.1.2.4)

Metal Stud Back-up Systems

T F N/A METAL STUD BACK-UP SYSTEMS, GENERAL: Additional steel studs frame window and door openings. Corrosion of veneer ties, tie screws, studs, and stud tracks is minimal. Stud tracks are adequately fastened to the structural frame. (Section 10.1.3.1)

T F N/A MASONRY VENEER WITH STUD BACK-UP: Masonry veneer more than 30 feet above the ground is supported by shelf angles or other elements at each floor level. Masonry veneer is adequately anchored to the back-up at locations of through-wall flashing. Masonry veneer is connected to the back-up with corrosion-resistant ties spaced 24 inches on center maximum and with at least one tie for every 2-2/3 square feet. (Section 10.1.3.2)

Masonry Veneer with Concrete Block Back-up

T F N/A MASONRY VENEER WITH CONCRETE BLOCK BACK-UP, GENERAL: The concrete block back-up qualifies as reinforced masonry. (Section 10.1.4.1)

T F N/A MASONRY VENEER SUPPORT: Masonry veneer more than 30 feet above the ground is supported by shelf angles or other elements at each floor level. Masonry veneer is adequately anchored to the back-up at locations of through-wall flashing. Masonry veneer is connected to the back-up with corrosion-resistant ties spaced 24 inches on center maximum and with at least one tie for every 2-2/3 square feet. The concrete block back-up is positively anchored to the structural frame at 4 feet maximum intervals along the floors and roofs. (Section 10.1.4.2)

Other Veneer/panel Systems

T F N/A THIN STONE VENEER PANELS: Stone anchorages are adequate for computed loads. (Section 10.1.5.1)

T F N/A WOOD/AGGREGATE PANELS: There is no visible deterioration of screws or wood at panel attachment points. (Section 10.1.5.2)

Parapets, Cornices, Ornamentation, and Appendages

T F N/A PARAPETS, CORNICES, ORNAMENTATION, AND APPENDAGES: There are no laterally unsupported unreinforced masonry parapets or cornices above the highest anchorage level with height/thickness ratios greater than 1.5. Concrete parapets with height/thickness ratios greater than 1.5 have vertical reinforcement. Cornices, parapets, signs, and other appendages that extend above the highest anchorage level or cantilever from exterior wall faces and other exterior wall ornamentation are reinforced and well anchored to the structural system. (Section 10.1.6)

T F N/A MEANS OF EGRESS: Canopies are anchored and braced to prevent collapse and blockage of building exits. (Section 10.1.7)

~~**NONSTRUCTURAL ELEMENTS**~~

~~**T F N/A** CEILING SYSTEMS: Ceiling-supported lighting or mechanical fixtures are adequately braced or supported. The ceiling system is not required to laterally support the top of gypsum board, masonry, or hollow clay tile partitions. (Section 10.2.1)~~

~~T F N/A~~ ~~EMERGENCY LIGHTING EQUIPMENT: Emergency lighting equipment and signs are anchored and/or braced to resist vertical and horizontal earthquake loads. (Section 10.2.2)~~

~~T F N/A~~ ~~CHIMNEYS: No unreinforced masonry chimney extends above the roof surface more than twice the least dimension of the chimney. Masonry chimneys are anchored to the floors and roof. (Section 10.2.3)~~

~~T F N/A~~ ~~MEANS OF EGRESS: Stair enclosures do not contain any piping or equipment except as required for life safety. Canopies are anchored and braced to prevent collapse and blockage of building exits. (Section 10.2.4)~~

~~T F N/A~~ ~~MECHANICAL AND ELECTRICAL EQUIPMENT: No pieces of mechanical equipment weighing more than 20 pounds are suspended from the structure without seismic bracing. (Section 10.2.5)~~

ARTICLE 11

EVALUATION OF CRITICAL NONSTRUCTURAL COMPONENTS AND SYSTEMS

11.0 INTRODUCTION

This article covers nonstructural components and systems critical to patient care.

11.01 NONSTRUCTURAL EVALUATION PROCEDURE

1. The nonstructural evaluation process shall include the following steps:

    1. Site visit and data collection;

    2. Identification of building SPC;

    3. Identification of critical nonstructural systems;

    4. Identification of critical care services housed in the building;

    5. Final evaluation for the critical nonstructural elements and systems;

    6. Preparation of evaluation report, and

    7. Submittal of evaluation report to OSHPD.

2. A general acute care hospital facility may be exempted from a nonstructural evaluation upon submittal of a written statement by the hospital owner to OSHPD certifying the following conditions:

    1. The building is designated ANPC 1" in conformance with Table 11.1 ANonstructural Performance Categories@, or
    2. The building is designated ANPC 4" in conformance with Table 11.1 ANonstructural Performance Categories@ and provided:
        a) The building was designed and constructed under a building permit issued by OSHPD;
        b) All subsequent repairs, remodels, additions and alterations were performed under a permit issued by OSHPD, and
        c) Fire sprinkler systems have been retrofitted in conformance with Table 11.1, ANonstructural Performance Categories@.

11.1 NONSTRUCTURAL PERFORMANCE CATEGORIES

Each building shall be assigned a Nonstructural Performance Category (NPC), based upon the degree of anchorage and bracing of selected nonstructural elements and systems. This includes architectural, mechanical, electrical, and hospital equipment in addition to associated conduit, ductwork, piping, and machinery. NPCs are defined in Table 11.1.

11.1.1 Site Visit and Evaluation
The evaluator shall:

1. Visit the building to observe and record the type, nature, and physical condition of the nonstructural elements and systems;

2. Note the SPC of the buildings based on procedures followed in Article 2;

3. Assemble building design data including:

    a. Construction drawings, specifications and calculations, and

    b. All drawings, specifications and calculations for remodeling work.

4. During the visit, the evaluator shall:

    a. Verify existing data;

    b. Develop other needed data (e.g., measure and sketch building if necessary);

    c. Verify the critical nonstructural systems;

    d. Verify the critical care areas/services, and

    e. Identify special conditions which may impact the nonstructural systems or endanger the function of the critical care areas/services.

    If drawings are not available, the site visit and evaluation shall be performed as described in this section.

5. Review other data available such as assessments of building performance and function following past earthquakes;

6. Prepare a summary of data using an OSHPD approved format;

7. Perform the evaluation using the procedures in Section 11.2.

8. Prepare a report of the findings of the evaluation using an OSHPD approved format.

11.2 EVALUATION OF BUILDINGS

Conforming and nonconforming buildings shall be placed in an NPC based upon the degree of anchorage and bracing for those systems and equipment specified in Table 11.1. Buildings which do not meet the requirements for NPC 2 as defined in Table 11.1 shall be placed in NPC 1.

11.2.1. Procedures for NPC 2

The following steps shall determine if the building meets the criteria for NPC 2:

11.2.1.1 Scope of the Evaluation

The anchorage and bracing of components and equipment for the following systems shall be evaluated for conformance with Part 2, Title 24:

a) Communications systems;

b) Emergency power systems;
c) Bulk medical gas systems, and

d) ~~d)~~ Fire alarm systems.

e) **Emergency lighting equipment and signs in the means of egress.**

11.2.1.2 Evaluation Procedure

a) Identify components and equipment that are subject to the requirements of NPC 2;

b) Conduct an inventory of components and equipment listed in 11.2.1.1, noting whether the items are anchored or braced;

~~c) Determine if the anchorage or bracing of any components and equipment identified in Section 11.2.1.2(a) has been installed under a permit issued by OSHPD. Drawings showing the installation and bearing an OSHPD approval stamp are required to show that the installation conforms to Part 2, Title 24. Anchorage and bracing of elements installed under a permit issued by OSHPD are considered to meet the requirements of NPC 2;~~

c) Determine if the anchorage or bracing of any components and equipment identified in Section 11.2.1.2(a) complies with the following conditions:

1. Installed under a permit issued by OSHPD. Drawings showing the installation and bearing an OSHPD approval stamp are required to show that the installation conforms to Part 2, Title 24; or,

2. Reviewed and approved by the Department of General Services, Office of Architecture and Construction, Structural Safety Section. Drawings showing: a) the installation; b) bear an Office of Architecture and Construction, Structural Safety Section approval stamp; and c) a five digit project number on the approval that begins with the "H" prefix, are required to demonstrate that the installation conforms to Part 2, Title 24. It shall also be demonstrated by a written report submitted by the structural engineer, acceptable to the enforcement agency, that an investigation of the anchorage and bracing of components and equipment identified in Section 11.2.1.2(a) shows it to be constructed in reasonable conformity with these drawings.

Anchorage and bracing of elements that comply with the conditions of 11.2.1.2(c)1 or 11.2.1.2(c)2 are considered to meet the requirements of NPC 2;

Installation is defined as that which shows the size and type of material for all components of the system, including the anchor or fastener manufacturer (if proprietary), type, total number and embedment if connected to structural concrete, masonry or wood.

d) If the components and equipment inventoried in 11.2.1.2(b) is anchored or braced, but do~~es~~ not meet the requirements of Section 11.2.1.2(c), determine ~~by calculation~~ if the bracing and anchorage is sufficient to meet the code requirements specified in Table 11.1. The bracing capacity shall be determined by ~~C~~calculations ~~of bracing and anchorage capacity shall be~~ based upon information shown in the construction documents. If these documents are incomplete or unavailable, the evaluation shall be based on the as-built conditions, with the capacity of fasteners to masonry, concrete, or wood determined by approved tests, and

e) If any of the items inventoried in 11.2.1.2(b) are unanchored or inadequately braced as determined by Section 11.2.1.2(d), the building shall be placed in NPC 1.

11.2.2 Procedures for NPC 3

The following steps shall determine if the building meets the criteria for NPC 3:

11.2.2.1 Scope of the Evaluation

The components and equipment to be evaluated are specified in Table 11.1.

11.2.2.2 Evaluation Procedure

a) To be eligible for evaluation for NPC 3, the building must meet the criteria for NPC 2;

b) Identify components and equipment that are subject to the requirements of NPC 3;

c) Conduct an inventory of components and equipment specified in Table 11.1, NPC 3, noting whether the components and equipment are anchored or braced;
Exception: Any general acute care hospital facility located in both a Arural area@ as defined in Section 70059.1, Division 5, Title 22 *and* Seismic Zone 3 shall comply with the fire sprinkler system anchorage and bracing requirements of NFPA 13, 1994 edition or subsequent standard by January 1, 2013.

~~d) Determine if the anchorage or bracing of any of the components and equipment inventoried in Section 11.2.2.2(c) has been installed under a permit issued by OSHPD. Drawings showing the installation and bearing an OSHPD approval stamp are required to show that the installation conforms to Part 2, Title 24. Anchorage and bracing of elements installed under a permit issued by OSHPD are considered to meet the requirements of NPC 3;~~

d) Determine if the anchorage or bracing of any components and equipment identified in Section 11.2.1.2(a) complies with the following:

1. Installed under a permit issued by OSHPD. Drawings showing the installation and bearing an OSHPD approval stamp are required to show that the installation conforms to Part 2, Title 24; or,

2. Reviewed and approved by the Department of General Services, Office of Architecture and Construction, Structural Safety Section. Drawings showing: a) the installation; b) bear an Office of Architecture and Construction, Structural Safety Section approval stamp; and c) a five digit project number on the approval stamp that begins with an "H" prefix, are required to demonstrate that the installation conforms to Part 2, Title 24. It shall also be demonstrated by a written report submitted by the structural engineer, acceptable to the enforcement agency, that an investigation of the anchorage and bracing of components and equipment identified in Section 11.2.2.2(b) shows it to be constructed in reasonable conformity with these drawings.

Anchorage and bracing of elements that comply with the conditions of 11.2.1.2(d)1 or 11.2.1.2(d)2 are considered to meet the requirements of NPC 3;

Installation is defined as that which shows the size and type of material for all components of the system including the anchor or fastener manufacturer (if proprietary), type, total number and embedment if connected to structural concrete, masonry or wood.

e) If the components and equipment inventoried in 11.2.2.2(c) is anchored or braced, but do~~es~~ not meet the requirements of Section 11.2.2.2(d), determine ~~by calculation~~ if the bracing and anchorage is sufficient to meet the code requirements specified in Table 11.1. The bracing capacity shall be determined by ~~C~~calculations ~~of bracing and anchorage capacity shall be~~ based upon information shown in the construction documents. If these documents are incomplete or unavailable, the evaluation shall be based on the as-built conditions, with the capacity of fasteners to masonry, concrete, or wood determined by approved tests, and

f) If any of the items inventoried in 11.2.2.2(c) is inadequately anchored or braced as determined by Section 11.2.2.2(e), the building shall be placed in NPC 2.

11.2.3 PROCEDURES FOR NPC 4

The following steps shall be followed to determine if the building meets the criteria for NPC 4:

11.2.3.1 Scope of the Evaluation

The components and equipment to be evaluated are specified in Table 11.1.

11.2.3.2 Evaluation Procedure

a) To be eligible for evaluation for NPC 4, the building must meet the criteria for NPC 3;

b) Identify components and equipment that are subject to the requirements of NPC 4;

c) Conduct an inventory of components and equipment specified in Table 11.1, NPC 4, noting whether the components and equipment are anchored or braced;

~~d) Determine if the anchorage or bracing of any of the components and equipment inventoried in Section 11.2.3.2(c) has been installed under a permit issued by OSHPD. Drawings showing the installation and bearing an OSHPD approval stamp are required to show that the installation conforms to Part 2, Title 24. Anchorage and bracing of elements installed under a permit issued by OSHPD are considered to meet the requirements of NPC 4;~~

d) Determine if the anchorage or bracing of any components and equipment identified in Section 11.2.1.2(a) complies with the following conditions:

1. Installed under a permit issued by OSHPD. Drawings showing the installation and bearing an OSHPD approval stamp are required to show that the installation conforms to Part 2, Title 24; or,

2. Reviewed and approved by the Department of General Services, Office of Architecture and Construction, Structural Safety Section. Drawings showing: a) the installation; b) bear an Office of Architecture and Construction, Structural Safety Section approval stamp; and c) a five digit project number on the approval stamp that begins with an "H" prefix, are required to demonstrate that the installation conforms to Part 2, Title 24. It shall also be demonstrated by a written report submitted by the structural engineer, acceptable to the enforcement agency, that an investigation of the anchorage and bracing of components and equipment identified in Section 11.2.3.2(b) shows it to be constructed in reasonable conformity with these drawings.

Anchorage and bracing of elements that comply with the conditions of 11.2.1.2(d)1 or 11.2.1.2(d)2 are considered to meet the requirements of NPC 4;

Installation is defined as that which shows the size and type of material for all components of the system including the anchor or fastener manufacturer (if proprietary), type, total number and embedment if connected to structural concrete, masonry or wood.

e) If the components and ~~equipment inventoried~~equipment inventoried in 11.2.3.2(c) are anchored or braced, but do not meet the requirements of Section 11.2.3.2(d), determine ~~by calculation~~ if the bracing and anchorage is sufficient to meet the code requirements specified in Table 11.1. The bracing capacity shall be determined by ~~C~~calculations ~~of bracing and anchorage capacity shall be~~ based upon information shown in the construction documents. If these documents are incomplete or unavailable, the evaluation shall be based on the as-built conditions, with the capacity of fasteners to masonry, concrete, or wood determined by approved tests, and

f) If any of the items inventoried in 11.2.3.2(c) is unanchored or inadequately braced as determined by Section 11.2.3.2(e), the building shall be placed in NPC 3.

11.2.4 PROCEDURES FOR NPC 5

The following steps shall determine if the building meets the criteria for NPC 5:

11.2.4.1 Scope of the Evaluation

The components to be evaluated are specified in Table 11.1.

11.2.4.2 Evaluation Procedure

a) To be eligible for evaluation for NPC 5, the building must meet the criteria for NPC 4 and have provisions for onsite supplies of water and holding tanks for wastewater for 72 hours of acute care operation and onsite fuel supply for 72 hours of acute care and radiological service operation;

b) Identify components and equipment that are subject to the requirements of NPC 5;

c) Conduct an inventory of components and equipment specified in Table 11.1, NPC 5, noting whether the components and equipment are anchored or braced;

~~d) Determine if the anchorage or bracing of any of the components and equipment inventoried in Section 11.2.4.2(c) has been installed under a permit issued by OSHPD. Drawings showing the installation and bearing an OSHPD approval stamp are required to show that the installation conforms to Part 2, Title 24. Anchorage and bracing of elements installed under a permit issued by OSHPD are considered to meet the requirements of NPC 5;~~

d) Determine if the anchorage or bracing of any components and equipment identified in Section 11.2.1.2(a) complies with the following conditions:

1. Installed under a permit issued by OSHPD. Drawings showing the installation and bearing an OSHPD approval stamp are required to show that the installation conforms to Part 2, Title 24; or,

2. Reviewed and approved by the Department of General Services, Office of Architecture and Construction, Structural Safety Section. Drawings showing: a) the installation; b) bear an Office of Architecture and Construction, Structural Safety Section approval stamp; and c) a five digit project number on the approval stamp that begins with an "H" prefix, are required to demonstrate that the installation conforms to Part 2, Title 24. It shall also be demonstrated by a written report submitted by the structural engineer, acceptable to the enforcement agency, that an investigation of the anchorage and bracing of components and equipment identified in Section 11.2.4.2(b) shows it to be constructed in reasonable conformity with these drawings.

Anchorage and bracing of elements that comply with the conditions of 11.2.1.2(d)1 or 11.2.1.2(d)2 are considered to meet the requirements of NPC 5;

Installation is defined as that which shows the size and type of material for all components of the system including the anchor or fastener manufacturer (if proprietary), type, total number and embedment if connected to structural concrete, masonry or wood.

e) If the components and equipment inventoried in 11.2.4.2(c) are anchored or braced, but do not meet the requirements of Section 11.2.4.2(d), determine ~~by calculation~~ if the bracing and anchorage is sufficient to meet the code requirements specified in Table 11.1. The bracing capacity shall be determined by ~~C~~calculations ~~of bracing and anchorage capacity shall be~~ based upon information shown in the construction documents. If these documents are incomplete or unavailable, the evaluation shall be based on the as-built conditions, with the capacity of fasteners to masonry, concrete, or wood determined by approved tests, and

f) If any of the items inventoried in 11.2.4.2(c) is inadequately anchored or braced as determined by 11.2.4.2(e), the building shall be placed in NPC 4.

11.3 TESTING REQUIREMENTS FOR EVALUATING THE PERFORMANCE OF EXISTING MECHANICAL FASTENERS

A testing program shall be instituted to determine the capacity of mechanical fasteners used to anchor non-structural components including the bracing of pipes, ducts, and conduit, and the attachment of equipment and other components listed in the 1995 CBC, Part 2, Title 24, Table 16A-O. Anchors shall be categorized as either seismic bracing of pipes ducts or conduit or equipment and other component anchors.

11.3.1 Anchors Used in the Seismic Bracing of Pipes, Ducts, or Conduit

For anchors used in the seismic bracing of pipes, ducts, or conduit, the following shall apply:

1. 20% of the anchors (20 minimum) of a given size and type (wedge, shell and sleeve for expansion bolts), at each level of the structure shall be tension tested to 3 times the maximum calculated design load specified in Section 1630B but not less than 500 pounds. A minimum of one anchor in any 4-bolt group shall be tested assuming an equal distribution of the calculated force to the bolt group. One-quarter (1/4) inch diameter anchors need not be tested. Where none of the anchors in the group have calculated tension, testing shall consist of torque testing.

Exception: Internally threaded anchors, such as shell type anchors, shall be tested to 4 times the maximum calculated design loads. Attachment hardware shall be shimmed or removed prior to testing so that it does not prevent the possible withdrawal of the anchor.

2. If an anchor fails the tension test, 20 anchors, installed by the same trade, in the immediate vicinity of the failed anchor shall be tested prior to resuming to a 20% sampling rate for testing.

11.3.2 Anchors used in the attachment of equipment and other components

For anchors used in the attachment of equipment and other components listed in the 1995 CBC, Part 2, Title 24, Table 16A-O, The following shall apply:

1. A minimum of one anchor of a given size shall be tension tested for each piece of equipment or other component under consideration. Where the number of anchors for the piece of equipment or component exceeds four, a minimum of 20% of the anchors shall be tension tested. Where none of the anchors in the group have calculated tension, testing shall consist of torque testing.

2. The tension test load shall be 3 times the maximum tension force calculated for an anchor in the attachment group using the design loads specified in Section 1630B or 500 pounds minimum. One-quarter (1/4) inch diameter anchors need not be tested.

Exception: Internally threaded anchors, such as shell type anchors, shall be tested to 4 times the maximum calculated design loads. Attachment hardware shall be shimmed or removed prior to testing so that it does not prevent the possible withdrawal of the anchor.

3. If a single anchor fails, all anchors in the attachment group shall be tested. If two (2) or more anchors fail, the component shall be retrofitted for the forces as for new construction.

11.3.3 Tension Testing Procedure

1. Testing of anchors shall be accomplished by the application of externally applied direct tension force to the anchor. The testing apparatus shall not restrict the probable shear cone failure surface of the concrete or masonry.

2. Torque testing is not permitted in lieu of tension testing unless specifically allowed in these provisions.

3. A failure is defined when the tension load on the anchor produces a slip of 1/8 inch, a shear cone failure in the concrete or masonry, concrete splitting, or fracture of the steel anchor itself prior to attaining the test load value.

Exception: For internally threaded anchors the allowable slip shall not exceed 1/16 inch.

11.3.4 Alternate test criteria. In lieu of testing in accordance with Sections 11.3.1 or 11.3.2, a test load may be established by the evaluating engineer. The allowable load that the anchor can resist shall be determined by dividing the test load by the appropriate factors noted in Sections 11.3.1 or 11.3.2. No one-third increase is permitted for seismic or wind loads.

11.3.5 Allowable shear loads. Allowable shear loads on anchors shall be determined by either of the following:

1. Shear values listed in Table 19B-E, or;

2. Shear values shall be obtained by analysis using **Strength Design of Anchorage to Concrete,** Section A.6 published by the Portland Cement Association, 1999, with the specified reduction coefficient(s) to convert the "strength" values to allowable stress design values of 1.7.

Table 11.1
Nonstructural Performance Categories

Timeframes	Nonstructural Performance Category	Description
	NPC 1	Buildings with equipment and systems not meeting the bracing and anchorage requirements of any other NPC.
January 1, 2002	NPC 2	The following are braced or anchored in accordance with Part 2, Title 24[1]: # communications systems; # emergency power supply; # bulk medical gas systems; ~~and~~ # fire alarm systems~~.~~; and # emergency lighting equipment and signs in the means of egress.
January 1, 2008	NPC 3	The building meets the criteria for NPC A 2@ and in Critical Care Areas, clinical laboratory service spaces, pharmaceutical service spaces, radiological service spaces, and central and sterile supply areas, the following components meet the bracing and anchorage requirements of Part 2, Title 24[1]: # Nonstructural components, listed in the 1995 CBC, Part 2, Title 24, Table 16A-O, Part 2; and # Equipment, as listed in the 1995 CBC, Part 2, Title 24, Table 16A-O, AEquipment@ including equipment in the physical plant that service these areas. *Exceptions:* 1. Seismic restraints need not be provided for cable trays, conduit and HVAC ducting. Seismic restraints may be omitted from piping systems, provided that an approved method of preventing release of the contents of the piping system in the event of a break is provided. 2. Only elevator(s) selected to provide service to patient, surgical, obstetrical, and ground floors during interruption of normal power need meet the structural requirements of Part 2, Title 24[1]. # Fire sprinkler systems comply with the bracing and anchorage requirements of NFPA 13, 1994 edition or subsequent applicable standards. *Exception:* Acute care hospital facilities in both a rural area as defined by Section 70059.1, Division 5 of Title 22 and Seismic Zone 3 shall comply with the bracing and anchorage requirements of NFPA 13, 1994 edition or subsequent applicable standards by January 1, 2013.
	NPC 4	The building meets the criteria for NPC 3 and all architectural, mechanical, electrical systems, components and equipment, and hospital equipment meet the bracing and anchorage requirements of Part 2, Title 24[1]. This category is for classification purposes of the Office of Emergency Services.
January 1, 2030	NPC 5	The building meets the criteria for NPC A 4 @ and on-site supplies of water and holding tanks for wastewater, sufficient for 72 hours emergency operations, are integrated in to the building plumbing systems. As an alternative, hook-ups to allow for the use of transportable sources of water and sanitary waste water disposal have been provided. An on-site emergency system as defined within Part 3, Title 24 is incorporated into the building electrical system for critical care areas. Additionally, the system shall provide for radiological service and an onsite fuel supply for 72 hours of acute care operation.

[1] For the purposes of Article 11, all enumerated items within Table 11.1 shall meet the requirements of Section 1630B by the specified timeframe as indicated by their respective NPC.

1643B.1.1 Special Procedures: Where there are special prescriptive procedures for the repair and/or retrofit of existing buildings as a part of these regulations, the Uniform Code for Building Conservation (UCBC), or accepted practice by the Enforcement Agent, these procedures may be used in lieu of the requirements of Chapter 34. The following special prescriptive procedures may be used for their respective types of construction to meet the requirements of Division III-R:

[OSHPD 1: Exception: For hospitals, the loadings used in the special procedures may not be less than those determined for the building and site by Equation 44A-1.]

1643B.1.1.1 The UCBC for Unreinforced Masonry Bearing Wall Buildings (Appendix Chapter 1).

[OSHPD 1: Exception: For hospital buildings, the use of unreinforced masonry wall elements is not allowed.]

1643B.1.1.2 The UCBC for Cripple Walls and Anchor Bolts (Appendix Chapter 6).

[OSHPD 1: Where the requirements of these regulations for new construction are more restrictive, they shall govern. Section A604.4.2 of the UCBC is not adopted.
<u>Exception: Single story wood light frame hospital buildings as defined in Section 2.2.3, Article 2, Chapter 6, Part 1, Title 24, which fail the check of Section 5.6.4, Article 5, Chapter 6, Part 1, Title 24, may be upgraded to SPC 2 by seismically retrofitting this deficiency in accordance with the provisions of the UCBC for Cripple Walls and Anchor Bolts (Appendix Chapter 6).</u>]

Amend as follows Section 1648B.2.2:

1648B.2.2 *[For BSC, DSA] The ground motion characterization used for Method B shall be consistent with those required by 1643B.8. Where response spectra are used, they may be determined from a probabilistic site hazard analysis, or as the standard spectrum of Figure 16B-3, scaled by factor H as determined in 1643B.8 ~~[OSHPD 1: Where response spectra are used, they shall be determined from a probabilistic site hazard analysis.]~~ Where the importance factor is greater than 1, the Section 1643B.8.2 Exception 2 ground motion used shall include consideration of the importance factor; for response spectrum analysis use HI in place of H as the scaling factor.*

1648B.2.2.1 *[For OSHPD 1] The ground motion characterization used for Method B shall be based upon ground shaking having a 10% probability of exceedance in 50 years for category SPC-2 at the essential life safety performance level. For SPC-3 through SPC-5, the ground motion characterization used for Method B shall be based upon ground shaking having a 10% probability of exceedance in 50 years at the immediate occupancy performance level and the maximum considered earthquake at the collapse prevention performance level.*

Ground shaking having a 10% probability of exceedance in 50 years need not exceed 2/3 of the maximum considered earthquake.

Ground shaking response spectra for use in Method B shall be determined in accordance with either the General Procedure of Section 1648B.2.2.2 or the Site-Specific Procedure of Section 1648B.2.2.3.

In the General Procedure, ground shaking hazard is determined from the response spectrum acceleration contour maps. Maps showing 5%-damped response spectrum ordinates for short-period (0.2 second) and long-period (1 second) response distributed by FEMA for use with the "NEHRP Guidelines for the Seismic Rehabilitation of Buildings "(FEMA 273) shall be used directly with the General Procedure of Section 1648B.2.2.2 for developing design response spectra for either or both the 10% probability of exceedance in 50 years and the maximum considered earthquake. In the Site-Specific Procedure, ground shaking hazard is determined using a specific study of the faults and seismic source zones that may affect the site, as well as evaluation of the regional and geologic conditions that affect the character of the site ground motion caused by events occurring on these faults and sources.

The General Procedure may be used for any building. The Site-Specific Procedure may also be used for any building and shall be required where any of the following apply:

1. *The building is category SPC-5.*
2. *The building site is located within 10 kilometers of an active fault .*
3. *The building is located on Type E soils (as defined in Section 1648B.2.2.2) and the mapped maximum considered earthquake spectral response acceleration at short periods (S_S) exceeds 2.0g.*
4. *The building is located on Type F soils as defined in Section 1648B.2.2.2.*

   Exception: *Where S_S, determined in accordance with Section 1648B.2.2.2, < 0.20g. In these cases, a Type E soil profile may be assumed.*
5. *A time history response analysis of the building is performed as part of the design.*

1648B.2.2.2 *[For OSHPD 1]* ***General Procedure to Determine the Acceleration Response Spectra.*** *The general procedures of this section shall be used to determine the acceleration response spectra.*

Deterministic estimates of earthquake hazard, in which an acceleration response spectrum is obtained for a specific magnitude earthquake occurring on a defined fault, shall be made using the Site-Specific Procedures of Section 1648B2.2.3.

The mapped short-period response acceleration parameter, S_S, and mapped response acceleration parameter at a one-second period, S_1, for 10% probability of exceedance in 50 years ground motion shall be obtained directly from the maps distributed by FEMA for use with the "NEHRP Guidelines for the Seismic Rehabilitation of Buildings" (FEMA 273). The mapped short- period response acceleration parameter, S_S, and mapped response acceleration parameter at a one-second period, S_1, for the maximum considered earthquake shall also be obtained directly from the maps.

Parameters S_S and S_1 shall be obtained by interpolating between the values shown on the response acceleration contour lines on either side of the site, on the appropriate map, or by using the value shown on the map for the higher contour adjacent to the site.

The mapped short-period response acceleration parameter, S_S, and mapped response acceleration parameter at a one-second period, S_1, for 10% probability of exceedance in 50 years ground shaking hazards shall be taken as the smaller of the following:

1. *The values of the parameters S_S and S_1, respectively, determined for 10% probability of exceedance in 50 years ground motion.*

2. *Two-thirds of the values of the parameters S_S and S_1, respectively, determined from the maximum considered earthquake ground motion map.*

The design short-period spectral response acceleration parameter, S_{XS}, and the design spectral response acceleration parameter at one second, S_{X1}, shall be obtained respectively from Equations 48B-1 and 48B-2 as follows:

$$S_{XS} = F_a S_S \qquad (48B\text{-}1)$$

$$S_{X1} = F_v S_1 \qquad (48B\text{-}2)$$

Table 16B-R-3 Values of F_a as a Function of Site Class and Mapped Short-Period Spectral Response Acceleration S_S

Site Class	***Mapped Spectral Acceleration at Short Periods S_S***				
	S_S #0.25	***S_S = 0.50***	***S_S = 0.75***	***S_S = 1.00***	***S_S $1.25***
A	*0.8*	*0.8*	*0.8*	*0.8*	*0.8*
B	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
C	*1.2*	*1.2*	*1.1*	*1.0*	*1.0*
D	*1.6*	*1.4*	*1.2*	*1.1*	*1.0*
E	*2.5*	*1.7*	*1.2*	*0.9*	*0*
F	*0*	*	*	*	*

NOTE: Use straight-line interpolation for intermediate values of S_S.

* *Site-specific geotechnical investigation and dynamic site response analyses shall be performed.*

Table 16B-R-4 Values of F_v as a Function of Site Class and Mapped Spectral Response Acceleration at One- Second Period S_1

Site Class	***Mapped Spectral Acceleration at One-Second Period*** S_1				
	S_1 **# 0.1**	S_1 **= 0.2**	S_1 **= 0.3**	S_1 **= 0.4**	S_1 **$0.50**
A	*0.8*	*0.8*	*0.8*	*0.8*	*0.8*
B	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
C	*1.7*	*1.6*	*1.5*	*1.4*	*1.3*
D	*2.4*	*2.0*	*1.8*	*1.6*	*1.5*
E	*3.5*	*3.2*	*2.8*	*2.4*	*0*
F	*	*	*	*	*

NOTE: Use straight-line interpolation for intermediate values of S_1.

* *Site-specific geotechnical investigation and dynamic site response analyses shall be performed.*

where F_a and F_v are site coefficients determined respectively from Tables 16B-R-3 and 16B-R-4, based on the site class and the values of the response acceleration parameters S_S and S_1.

Site classes shall be defined as follows:

Class A: *Hard rock with measured shear wave velocity, $\bar{v}_s$ > 5,000 ft/sec*

Class B: *Rock with 2,500 ft/sec < $\bar{v}_s$ < 5,000 ft/sec*

Class C: *Very dense soil and soft rock with1,200 ft/sec < $\bar{v}_s$ # 2,500 ft/sec or with either standard blow count $\bar{N}$ > 50 or undrained shear strength $\bar{s}_u$ > 2,000 psf*

Class D: *Stiff soil with 600 ft/sec < $\bar{v}_s$ # 1,200 ft/ sec or with 15 < $\bar{N}$ # 50 or 1,000 psf # $\bar{s}_u$ < 2,000 psf*

Class E: *Any profile with more than 10 feet of soft clay defined as soil with plasticity index PI > 20, or water content w > 40 percent, and $\bar{s}_u$ < 500 psf or a soil profile with $\bar{v}_s$ < 600 ft/sec. If insufficient data are available to classify a soil profile as type A through D, a type E profile shall be assumed.*

Class F: *Soils requiring site-specific evaluations:*

1. *Soils vulnerable to potential failure or collapse under seismic loading, such as liquefiable soils, quick and highly-sensitive clays, collapsible weakly-cemented soils*

2. *Peats and/or highly organic clays (H > 10 feet of peat and/or highly organic clay, where H = thickness of soil)*

3. *Very high plasticity clays (H > 25 feet with PI > 75 percent)*

4. *Very thick soft/medium stiff clays (H > 120 feet)*

The parameters $\bar{v}_s$, $\overline{N}$, and $\bar{s}_u$ are, respectively, the average values of the shear wave velocity, Standard Penetration Test (SPT) blow count, and undrained shear strength of the upper 100 feet of soils at the site. These values shall be calculated from Equation 48B-3, below:

$$\overline{v_s}, \overline{N}, \overline{s_u} = \frac{\sum_{i=1}^{n} d_i}{\sum_{i=1}^{n} \frac{d_i}{v_{si}}, \frac{d_i}{N_i}, \frac{d_i}{s_{ui}}} \qquad \textit{(48B-3)}$$

where

N_I = *SPT blow count in soil layer "i"*
n = *Number of layers of similar soil materials for which data is available*
d_I = *Depth of layer "i"*
s_{ui} = *Undrained shear strength in layer "i"*
v_{si} = *Shear wave velocity of the soil in layer "i"*

and

$$\sum_{i=1}^{n} d_i = 100\, ft \qquad \textit{(48B-4)}$$

Where reliable v_s data are available for the site, such data shall be used to classify the site. If such data are not available, N data shall be used for cohesionless soil sites (sands, gravels), and s_u data for cohesive soil sites (clays). For rock in profile classes B and C, classification may be based either on measured or estimated values of v_s. Classification of a site as Class A rock shall be based on measurements of v_s either for material at the site itself, or for similar rock materials in the vicinity; otherwise, Class B rock shall be assumed. Class A or B profiles shall not be assumed to be present if there is more than 10 feet of soil between the rock surface and the base of the building.

A general, horizontal response spectrum shall be constructed by plotting the following two functions in the spectral acceleration vs. structural period domain, as shown in Figure 16B-R-1. Where a vertical response spectrum is required, it may be constructed by taking two-thirds of the spectral ordinates, at each period, obtained for the horizontal response spectrum.

$S_a = (S_{XS} / B_S)(0.4 + 3T / T_o)$ *(48B-5)*

for $0 \le T \# 0.2\, T_o$

$S_a = (S_{X1} / (B_1\, T))$ *for* $T \ge T_o$ *(48B-6)*

where T_o is given by the equation

$T_o = (S_{X1}\, B_S) / (S_{XS}\, B_1)$ *(48B-7)*

where B_S and B_1 are taken from Table 16B-R-5.

Table 16B-R-5 Damping Coefficients B_S and B_1 as a Function of Effective Damping ß

Effective Damping ß (percentage of critical)[1]	B_S	B_1
≤ 2	0.8	0.8
5	1.0	1.0
10	1.3	1.2
20	1.8	1.5
30	2.3	1.7
40	2.7	1.9
≥ 50	3.0	2.0

1. The damping coefficient may be based on linear interpolation for effective damping values other than those given.

A 5% damped response spectrum shall be used for the design of buildings and structural systems, with the following exceptions:

1. *For structures without exterior cladding an effective viscous damping ratio, ß, of 2% shall be assumed.*

2. *For structures with wood diaphragms and a large number of interior partitions and cross walls that interconnect the diaphragm levels, an effective viscous damping ratio, ß, of 10% maybe assumed.*

3. *For structures rehabilitated using seismic isolation technology or enhanced energy dissipation technology, the equivalent effective viscous damping ratio, ß, shall be determined in accordance with Section 1627B.10.2.*

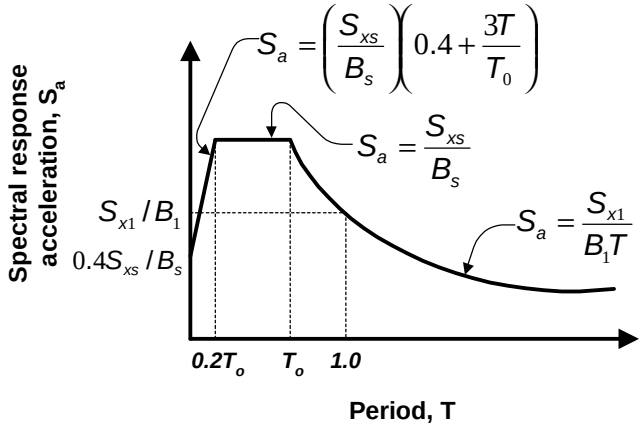

Figure 16B-R-1 General Response Spectrum

1648B.2.2.3 *[For OSHPD 1]* ***Site Specific Procedure to Determine the Acceleration Response Spectra***

Where site-specific ground shaking characterization is used as the basis of the design, the characterization shall be developed in accordance with this section.

Development of site-specific response spectra shall be based on the geologic, seismologic, and soil characteristics associated with the specific site. Response spectra shall be developed for an equivalent viscous damping ratio of 5%. Additional spectra may be developed for other damping ratios appropriate to the indicated structural behavior, as discussed in Section 1648B2.2.2. When the 5% damped site-specific spectrum has spectral amplitudes in the period range of greatest significance to the structural response that are less than 70 percent of the spectral amplitudes of the General Response Spectrum, an independent peer review of the spectrum shall be made by an individual with expertise in the evaluation of ground motion in accordance with Section 1649B.

The maximum considered earthquake ground motion shall be taken as that motion represented by an acceleration response spectrum having a 2% probability of exceedance within a 50 year period. The maximum considered earthquake spectral response acceleration at any period shall be taken from the 2% probability of exceedance within a 50 year period spectrum as limited by the following:

Where the spectral response ordinates at 0.2 second or 1 second for a 5% damped spectrum having a 2% probability of exceedance within a 50 year period exceeds the corresponding ordinates of the deterministic limit, the maximum considered earthquake ground motion spectrum shall be taken as the lesser of the probabilistic maximum considered earthquake ground motion or the deterministic maximum considered earthquake ground motion spectrum. The deterministic limit for the maximum considered earthquake ground motion response spectrum shall be calculated as 150% of the median spectral response accelerations at all periods resulting from a characteristic earthquake on any known active fault within the region and shall comply with the response spectrum determined in accordance with Figure 16B-R-2, where F_a and F_v are determined in accordance with Section 1648B.2.2.2 with the value of the mapped short period spectral response acceleration, S_S, taken as 1.5g and the value of the mapped spectral response acceleration at 1 second, S_1, taken as 0.6g.

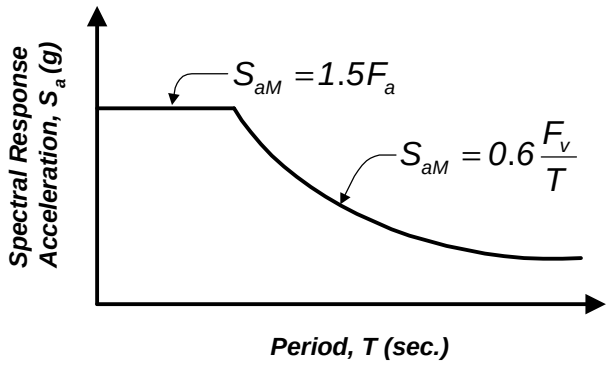

Figure 16B-R-2 Deterministic limit on maximum considered earthquake response spectrum

When a site-specific response spectrum has been developed and other sections of these regulations require values for the spectral response parameters, S_{XS}, S_{X1}, or T_0, they shall be obtained in accordance with this section. The value of the design spectral response acceleration at short S_{XS}, shall be taken as the response acceleration obtained from the site-specific spectrum at a period of 0.2 seconds, except that it shall be taken as not less than 90% of the peak response acceleration at any period. In order to obtain a value for the design spectral response acceleration parameter S_{X1}, a curve of the form $S_a = S_{X1}/T$ shall be graphically overlaid on the site-specific spectrum such that at any period, the value of S_a obtained from the curve is not less than 90% of that which would be obtained directly from the spectrum. The value of T_0 shall be determined in accordance with Equation 48B-8. Alternatively, the values obtained in accordance with Section 1648B.2.2.2 may be used for all of these parameters

$$T_0 = S_{X1} / S_{XS} \qquad \textit{(48B-8)}$$

Time-history analysis shall be performed with no fewer than three data sets (two horizontal components or, if vertical motion is to be considered, two horizontal components and one vertical component) of appropriate ground motion time histories that shall be selected and scaled from no fewer than three recorded events. Appropriate time histories shall have magnitude, fault distances, and source mechanisms that are consistent with those that control the design earthquake ground motion. Where three appropriate recorded ground- motion time history data sets are not available, appropriate simulated time history data sets may be used to make up the total number required. For each data set, the square root of the sum of the squares (SRSS) of the 5%-damped site-specific spectrum of the scaled horizontal components shall be constructed. The data sets shall be scaled such that the average value of the SRSS spectra does not fall below 1.4 times the 5%-damped spectrum for the design earthquake for periods between 0.2T seconds and 1.5T seconds (where T is the fundamental period of the building).

Where three time history data sets are used in the analysis of a structure, the maximum value of each response parameter (e.g., force in a member, displacement at a specific level) shall be used to determine design acceptability. Where seven or more time history data sets are employed, the average value of each response parameter shall be used to determine design acceptability.

1643B.8 Seismic Hazard Factor The Seismic Hazard Factor H shall be determined according to the following procedure.

1643B.8.1. When the Importance Factor, I, is equal to 1 then H is the lesser of either:

> ***Exception: [OSHPD 1: For hospitals this value of H may be used where I is equal to ~~greater than~~ 1.0 if: a) the assigned performance category is SPC-2 in Zone 3; or, b) the assigned performance category is SPC-2 in Zone 4 and the structure is more than 5 kilometers in distance from an active earthquake fault.]***

1643B.8.1.1 Three-quarters (0.75) of the Z value for the site as determined from Table 16B-I; or,

1643B.8.1.2 The effective peak ground acceleration (EPA) with a 20% probability of exceedance in 50 years determined from a probabilistic seismic hazard analysis for the specific site. ~~[OSHPD 1: In no case shall the EPA be less than 0.2g.]~~

> ***[OSHPD 1: Exception 1: When there has been a Section 1643B.8.1.2 analysis performed, the Enforcement Agent may accept the results of this prior study on a case by case basis].***
>
> ***Exception 2: The results of a community-wide probabilistic seismic analysis (Section 1643B.8.1.2) may be used when the responsible Enforcement Agent has accepted a probabilistic seismic hazard study for the jurisdiction to determine the value required by 1643B.8.1.2 for sites within the jurisdiction, provided that the study on which it is based was accepted by reviewers, who were selected and charged consistent with the professional requirements of Section 1649B.***

Amend Section 2203B.1 and 2203B.2 to the following:

SECTION 2203B - STRUCTURAL STEEL CONSTRUCTION

2203B.1 The design, fabrication and erection of structural steel shall be in accordance with the requirements of Division VIII (LRFD) or Division IX (ASD). ~~*Division VIII (LRFD) is not adopted for hospitals.*~~

2203B.2 Seismic design of structures shall comply with *Section 2211B.*~~.~~*or Division XI.*

Section 2211B.4.1 is amended to read as follows:

2211B4.1 Quality. Structural steel used in lateral-force-resisting systems shall conform to A 36, A 500, A 501, *A992,* A 572 (Grades 42 and 50) and A 588. Structural steel conforming to A 283 (Grade D) may be used for base plates and anchor bolts. **...**

All welds used in primary members and connections in the lateral force resisting system shall be made with a filler metal that has a minimum Charpy V-notch toughness of 20 ft-lbs at minus 20 degrees F, as determined by AWS Classification or manufacturer certification.

Section 2211B.7.1.2 is amended to read as follows:

2211B.7.1.2 Connection Strength. *Connection configurations utilizing welds or high-strength bolts shall demonstrate, by approved cyclic test results or calculations, the ability to sustain inelastic rotation and develop the strength criteria in Section 2211B.7.1.1 considering the effects of steel overstrength and strain hardening.*

Design of beam-to-column joints shall be substantiated by testing to have an inelastic rotation of at least 0.03 radians.

Section 2211B.10.12 is amended to read as follows:

2211B.10.12 Link beam-column connections. ...

3. The link-to-column connection design shall be substantiated by cyclic test results that equals or exceeds the rotation angle as prescribed in Section 2211B.10.12.2 .

Section 2212B.3 is amended to read as follows:

2212B.3 Tests of End-welded Studs. *End-welded studs shall be sampled, tested and inspected per the requirements of the Structural Welding Code-Steel,* ~~*1994*~~ *1998 edition, published by the American Welding Society.*

Section 2212B.4 is amended to read as follows:

2212B.4 ***Inspection of Shop Fabrication. ...***

When welds from web doubler plates or continuity plates occur in the k-area of rolled steel columns, the k-area adjacent to the welds shall be inspected after fabrication as required by the enforcement agency, using approved nondestructuve methods conforming to AWS D1.1. The k-area is defined in wide flange shapes to be the area of the web immediately adjacent to the flange, extending from the fillet to a point approximately 1-1/2 inches beyond the point of tangency between the fillet and the web.

Section 2212B.5 is amended to read as follows:

2212B.5 Inspection of Welding. *Inspection of all shop and field welding operations, including the installation of automatic end-welded stud shear connectors shall be made by a qualified welding inspector approved by the enforcement agency. Such inspector shall be a person trained and thoroughly experienced in inspecting welding operations. The inspector's ability to distinguish between sound and unsound welding shall be reliably established. The minimum requirements for a qualified welding inspector shall be as those for an AWS certified welding inspector (CWI), as defined in the provisions of the ~~1992 edition of AWS QCI, Standard and Guide for Qualification and Certification of Welding Inspectors~~ ANSI/AWS QC-1-96, Standard for AWS Certification of Welding Inspectors published by the American Welding Society. All welding inspectors shall be as approved by the enforcement agency.*

The ability of each welder to produce sound welds of all types required by the work shall be established by welder qualification satisfactory to the enforcement agency.

Welding inspection of structural welding shall conform to the requirements of AWS D1.1 Structural Welding Code-Steel, ~~1994~~ 1998 edition, published by the American Welding Society, except as modified by this section.

Welding inspection of cold-formed steel members shall conform to the requirements of AWS D1.3.

The welding inspector shall make a systematic record of all welds. This record shall include in addition to other required records:

1. Identification marks of welders.
2. List of defective welds.
3. Manner of correction of defects.

The welding inspector shall check the material, equipment, details of construction and procedure, as well as the welds. The inspector shall also check the ability of the welder. The inspector shall verify that the installation procedure for automatic end-welded stud shear connectors is in accordance with the requirements of AWS D1.1, Structural Welding Code-Steel, ~~1994~~ 1998 edition, published by the American Welding Society and the approved plans and specifications. The inspector shall furnish the architect, structural engineer and the enforcement agency with a verified report that the welding is proper and has been done in conformity with AWS D1.1, Structural Welding Code-Steel, ~~1994~~ 1998 edition, published by the American Welding Society, and the approved plans and specifications. The inspector shall use all means necessary to determine the quality of the weld. The inspector may use gamma ray, magnaflux, trepanning, sonics or any other aid to visual inspection which the inspector may deem necessary to be assured of the adequacy of the welding.

EXCEPTION: *Plant welding inspection of open-web steel joists may be waived with the approval of the enforcement agency where welding inspection is provided at the jobsite.*

Section 2212B.8 is added as follows.

2212B.8 Tests of Beam to Column Moment Connections. *When testing is required in these provisions for beam-to-column moment connections in moment frames and link-to-column connections in eccentric braced frames, it shall meet the requirements of Appendix S Qualifying Cyclic Tests of Beam and Link-To-Column Connections as part of the Seismic Provisions for Structural Steel Buildings, April 15, 1997 published by the American Institute of Steel Construction, 1 East Wacker Drive, Suite 3100, Chicago, IL 60601, including Supplement No. 1 dated February 15, 1999, with the amendments of Section 2214B.*

Add a new Division to Chapter 22 Steel as follows:

Division XI - SEISMIC PROVISIONS FOR STRUCTURAL STEEL BUILDINGS

Based on Seismic Provisions for Structural Steel Buildings of the American Institute of Steel Construction, Part I.

(April 15, 1997)

SECTION 2213B - ADOPTION

Except for the modifications as set forth in Section 2214B of this Division and the requirements of the building code, the seismic design, fabrication, and erection of structural steel shall be in accordance with the Seismic Provisions for Structural Steel Buildings, April 15, 1997 published by the American Institute of Steel Construction, 1 East Wacker Drive, Suite 3100, Chicago, IL 60601, including Supplement No. 1 dated February 15, 1999.

SECTION 2214B - AMENDMENTS

The Seismic Provisions for Structural Steel Buildings, hereinafter referred to as AISC Seismic 97, shall include only Part I (LRFD) and Appendix S. Where other codes, standards, or specifications are referred to in AISC Seismic 97 they are considered as supplemental standards and only considered guidelines subject to the approval of the enforcement agency.

1. Part I, Section 4.1. Revise to the following:

Q_E is the horizontal component of the earthquake load *1.5*E ~~in the applicable building code~~ *where E is the earthquake load from Chapter 16B Division III* . Where required in these Provisions, an amplified horizontal earthquake load $O_o Q_E$ shall be used in lieu of Q_E as given in the load combinations below. The term O_o is the System Overstrength Factor as defined in the Applicable Building Code. In the absence of such definition, O_o shall be as listed in Table I- 4-1.

2. Part I, Section 4.1. Add the following at the end of the Section.

Load combinations from LRFD Specification Section A4.1 shall be revised where E is the earthquake load from Chapter 16B Division III as follows:

1.2D ± 1.5E + 0.5L +0.2S *(A4-5)*

0.9D ±(1.3W or 1.5E) *(A4-6)*

3. Part I, Glossary. Add the following:

Rapid Strength Deterioration: A mode of behavior characterized by a sudden loss of strength. In a cyclic test with constant or increasing deformation amplitude, a loss of strength of more than 50 percent of the strength attained in the previous excursion in the same loading direction.

4. Part I, Glossary. Ordinary, Intermediate, and Special Truss Moment Frame (OMF, IMF and STMF). Delete.

5. Part I, Section 9.2 amend to read as the following:

9.2. Beam-to-Column Joints and Connections

9.2a. The design of all beam-to-column joints and connections used in the Seismic Force Resisting System shall be based upon qualifying cyclic test results in accordance with Appendix S that demonstrate an inelastic rotation of at least 0.03 radians. Qualifying test results shall consist of at least ~~two~~ *three* cyclic tests and shall be based upon one of the following requirements:

a. Tests reported in research or documented tests performed for other projects that are demonstrated to reasonably match project conditions.

b. Tests that are conducted specifically for the project and are representative of project member sizes, material strengths, connection configurations, and matching connection processes.

6. Part I, Section 10. Intermediate Moment Frames (IMF) including Commentary Section C10. Delete.

7. Part I, Section 11. Ordinary Moment Frames (OMF) including Commentary Section C11. Delete.

8. Part I, Section 12. Special Truss Moment Frames (STMF) including Commentary Section C12. Delete.

9. Part I, Section 15.4b. Add the following to the end of the paragraph:

15.4b. Where reinforcement at the beam-to-column connection at the Link end precludes yielding of the beam over the reinforced length, the Link is permitted to be the beam segment from the end of the reinforcement to the brace connection. Where such Links are used and the Link length does not exceed 1.6 M_p/V_p, cyclic testing of the reinforced connection is not required if the design strength of the reinforced section and the connection equals or exceeds the required strength calculated based upon the strain-hardened Link as described in Section 15.6a. Full depth stiffeners as required in Section 15.3a. shall be placed at the Link-to-reinforcement interface. *Cyclic testing of the Link connection to the weak axis of a wide flange column is required for any length link.*

10. Part I, Section S2. Add the following:

S2. SYMBOLS

? Peak deformation (interstory drift angle) in radians used to control loading of the test specimen.

11. Part I, Section S3. Revise to read as follows:

S3. DEFINITIONS

Inelastic Rotation. The permanent or plastic portion of the rotation angle between a beam and the column or between a Link and the column of the Test Specimen, measured in radians. The Inelastic Rotation shall be computed based upon an analysis of Test Specimen deformations. Sources of Inelastic Rotation include yielding of members and connectors, yielding of connection elements, and slip between members and connection elements. ~~Inelastic Rotation shall be computed based upon the assumption that inelastic action is concentrated at a single point located at the intersection of a line connecting the centerline of the inflection point of the beam or Link with the centerline of the beam at the column face.~~ *The rotation is represented by the plastic chord rotation angle calculated as the plastic deflection of the beam or girder, at the center of its span divided by the distance between the center of the beam span and the centerline of the panel zone of the beam column connection .*

12. Part I, Section S5.2. Revise to read as follows:

S5.2. Size of Members

1. The size of the beam or Link used in the Test Specimen shall be within the following limits:

a. *At least one of the test beams or Links shall be 100% of the depth of the prototype beam or Link. For the remaining specimens ,* ~~T~~the depth of the test beam or Link shall be no less than 90 percent of the depth of the Prototype beam or Link.

b. *At least one of the test beams or Links shall be 100% of the weight per foot of the prototype beam or Link. For the remaining specimens ,* ~~T~~*the* weight per foot of the test beam or Link shall be no less than 75 percent of the weight per foot of the Prototype beam or Link.

...

13. Part I, Section S6.3. Revise to the following:

S6.3 Loading Sequence

Loads shall be applied to the Test Specimen, up to the completion of the test, to produce the following deformations:

1. 6 cycles of loading at ? = 0.00375

2. 6 cycles of loading at ? = 0.005

3. 6 cycles of loading at ? = 0.0075

4. 4 cycles of loading at ? = 0.01

5. 2 cycles of loading at ? = 0.015

6. 2 cycles of loading at ? = 0.02

7. 2 cycles of loading at ? = 0.03

8. After completion of loading cycles at 0.03 ,testing shall be continued to applying cyclic loads to produce ? equal to 0.04 ,0.05 ,etc., with two complete loading cycles at each increment.

Or alternatively, the loading sequence may be the following :

1. 3 cycles of loading at 0.25 d_y _ d_ 0.5 d_y
2. 3 cycles of loading at 0.6 d_y _ d_ 0.8 d_y
3. 3 cycles of loading at d= d_y
4. 3 cycles of loading at d= 2 d_y
5. 3 cycles of loading at d= 3 d_y
6. 2 cycles of loading at d= 4 d_y
7. After completion of the loading cycles at 4 d_y, testing shall be continued by applying cyclic loads to produce dequal to 5 d_y, 6 d_y, 7 d_y, etc. Two cycles of loading shall be applied at each incremental value of deformation.

Other loading sequences are permitted to be used to qualify the Test Specimen when they are demonstrated to be of equivalent severity.

14. Part I - Section S10. Revise as follows:

S10. ACCEPTANCE CRITERIA

For each connection used in the actual frame, at least ~~two~~ *three* cyclic tests are required for each condition in which the Essential Variables, as listed in Section ~~S4~~ S5, remain within the required limits. All tests shall satisfy the criteria stipulated in Sections ~~8.5,~~ 9.2, ~~10.2~~, or 15.4, as applicable. In order to satisfy Inelastic Rotation requirements, each Test Specimen shall sustain the required rotation for at least ~~one complete loading cycle.~~ *two complete loading cycles without exhibiting rapid strength deterioration.*